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5. Automatic cutters for the gas cutting of plates are widely used. These cutters greatly improve the cutting of curved line edges and strips regardless of the type or thickness of metal and are also used for the separating of welded edges. The cutting can take place with several burners being used at one time. Use is still made of machine tools, such as guillotines, disc shears and edge planing machines for cutting.
6. At present plates are often cut by the bundle and shaped cold and there have been experiments in the cold bending of the external hull plates. Presses used for this cold shaping have pressures up to 2000 tons (in the Leningrad shipbuilding enterprises and in others).
7. All working of the steel takes place in the hull working shop and is on a continuous basis.
8. In the majority of Soviet factories and shipyards the construction of medium and heavy ships is done with large sections and with the use of the "parallel" system of construction (all parts ready for completion when they are laid on the ways). During the construction of a ship a "lateral" supplying of large sections is carried out at a short distance from the assembly welding stands.
9. Materials that have been processed in the hull shop then go to the assembly of flat elements (preliminary assembly). From the flat elements and separate components the assembly of flat, semivolumetric and volumetric sections is carried out. Automatic welders are widely used in this process.
10. Installation work is carried out simultaneously with the assembly of the sections. Volumetric sections in which the installation work has been completed are called "block-sections".
11. The sections are sent to the ways where they are joined together. In welding the seams in the lower position, "sectioners" are used on the table of which the sections are supported. By turning the table, the section can be placed in the necessary position. For assembly and welding of small hulls and individual sections, the so-called "tilting device" is used.
12. To lubricate the ways during launching a mixture of mineral greases or a soapy compound is used, instead of the animal fat mixture.

The Sequence of Work in the Construction of a Ship and the Principle of  
Deployment of Production Sections

13. After the ship's pattern has been laid out the material is marked and processed in the hull shop. These processed materials then go to the intermediate warehouse where they are sorted and from there are sent to the assembly-welding shop. From this shop the parts go to the ways where they are assembled.
14. The necessary keelblocks, casings, supports and timbers are put into position before the ship parts are laid on the ways.
15. The completion of the assembly of the hull on the ways (or in the assembly-welding shop simultaneously with the hull work by block sections) is the work of the assembly-installation and pipe shops. The former takes care of all outboard apertures, between decks fittings and installation-machine work while the latter installs pipe fittings.
16. The general position of the shops, installations, special equipment and service quarters of the factory or wharf are carried on the plan of the factory or wharf. The profile of the factory, extent and form of sections under the production shops and any local conditions (climatic, hydrological, meteorological and others) have an effect on the overall aspect of the general plan of the factory and, consequently, on the shipbuilding part of the factory.
17. Ship construction presents certain requirements to the situation of the shops. In a factory of the full or nearly full profile the basic production shops are situated in the following manner: The first line consists of processing shops, the second line of construction shops and the third line of completion-installation shops.
18. In the assembly of the hull, the processing shops send all their production to the ways but the finishing-installation shops work primarily in the finishing area.
19. In shipyards having a parallel work method, the first line of production shops consist of hull-processing, assembly-welding and hull-construction shops. In the second line are the finishing-installation shops serving the assembly-welding shop and the hull-construction shop (the building ways).
20.   in Soviet shipbuilding factories the construction of heavy ships is accomplished by use of large sections and by the parallel method of

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construction. As a result only a small amount of work remains to be done after the ship is launched (5-10% of all labor expenditure) and this work is done by the finishing installation group of shops or by a special finishing-installation shop.

21. The construction of the ship's hull is based on the production divisions which are set up in the following order:

- (a) Steel warehouse
- (b) Hull materials processing shop
- (c) Intermediate warehouse
- (d) Preliminary assembly and welding area
- (e) Section assembly area
- (f) The ways
- (g) Finishing places

#### Composition of the Building Slip (Ways) Schedule

22. The following factors figure in the assignment of quotas to the various factories and yards:

- (a) The "ways potential"
- (b) Climatic conditions;
- (c) Equipment of the factory-machine tools, devices, lifting-transport machines, etc.

23. The "ways potential" is a term which includes the number of ways at a given factory, their lengths, widths, angles of slope, distance between their axes, their calculated load capacities and their crane equipment.

24. Climatic conditions have a strong direct effect on the period of construction. If the factory is located in a warm climate where there is a slight, and even more important, a short lasting change in the tides, ship construction can be carried on at any time. Examples of factories of this type are the Sevastopol Merchant Factory and the ship-building and repair factory in Odessa (formerly Factory imeni Marti). Icing of the water at a factory severely limits the construction period. It is true that there have been some cases where ships have been launched at the Leningrad yards in spite of the ice, but such launchings are fraught with inconvenience. Besides, low temperatures make certain phases of construction work very difficult and cause the loss of many man hours of labor.

25. When the factory receives its production program it must make out a ways schedule accordingly, establishing a set time for laying the keel, launching, testing and delivery of the ship. The ways schedule is the basis of all production planning at a factory. The ways schedule shows graphically, by the calendar, the extent of time to be spent from the laying of the keel to the delivery of the ship. This schedule is made for every way and for every ship built. In the making up of the schedule special attention is directed toward the more even distribution of working power up to launching and on the finishing work.

#### The Yearly Ways Production Plan

26. A typical normal production chart is made up for every type of ship. Included in this chart is the job nomenclature and by every job there is a segment of a certain length showing the duration of the assembly and installation work while above the segment on the basis of the production, the man hours of work involved are listed separately by each specialty. In compiling the consolidated chart all loads are broken down into 12-15 groups.

27. These charts which make possible the issuance of a yearly production plan for the ways, are imposed in such a way that their points of laying coincide with the points of laying in the ways schedule. The amount of labor needed by weeks is summarized in the ways production plan and an oscillation is established between the amount of labor needed and the required production so that the amount of labor required will be at the minimum. The size of the segments signifying the periods of assembly on the ways depends on the accepted degree of readiness of the ship on the ways.

28. In the parallel method of construction which is typical of Soviet shipbuilding, ships are launched at a maximum degree of readiness and in many cases are launched completely finished (as was done in the construction of the tankers "Klaipeda" and "Leningrad" at the Leningrad shipyards). Under this system the number of hulls launched from the ways will be smaller and powerful cranes are required on the ways to load the heavy machinery into the hull. Usually these cranes operate with a light work load coefficient but to make up for this they and the powerful cranes take the work burden from the quay cranes.

29. In the majority of cases the launching of ships in a nearly or entirely completed state cuts down on production time as the completion of ships afloat is much more difficult.

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30. In current requirements presented to the project of a ship, the method of construction, sequence of work and the technological construction plan of the ship are all worked out in the ship's project itself.

Work Done Preparatory to the Construction of a Ship

31. When a contract is signed for the delivery of a ship, the construction enterprise analyses its assignment both from a technical and from an operational and economic viewpoint. Then the construction people make an outline plan for the ship construction (sometimes several plans) and the ordering firm selects one plan for approval. After this approval is given, the construction process starts into motion. The basic plan is then used to develop a series of detailed plans for construction use. This stage of planning is done either by the factory itself or by a planning organisation with which the factory concludes a special contract. Usually the factory has its own planning office.
32. The construction organisation then submits the plans and an order for all necessary materials to the ministry and also lists the technical requirements for all parts which have to be ordered from contracting organisations.
33. The basic requirements for preparation for construction are as follows: Materials should arrive at the factory in composite units according to the order established by the plan. When the keel is laid, all parts and materials should be in the warehouses.

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